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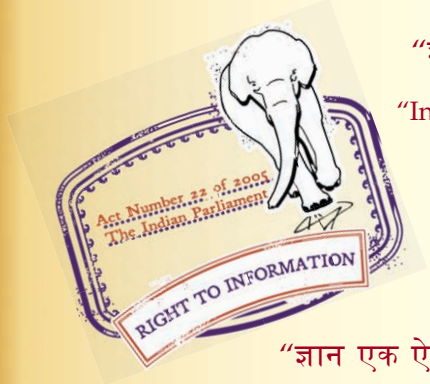

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GUIDE FOR USE OF VARIABLE CAPACITORS IN ELECTRONIC EQUIPMENT

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GUIDE FOR USE OF VARIABLE CAPACITORS IN ELECTRONIC EQUIPMENT

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 29 October 1976, after the draft finalized by the Capacitors and Resistors for Electronic Equipment Sectional Committee had been approved by the Electronics and Telecommunications Division Council.

0.2 This standard outlines the methods which should be followed by the equipment designer and those handling or using variable capacitors. The guidance given in this guide will enable the user of variable capacitors to extend the useful and accurate life of component by ensuring that it is used and handled correctly during the equipment production processes and during the subsequent life of the capacitor.

0.3 The variable capacitor is a component which, because of its robust construction, is probably misused more than any other electronic component. It is hoped that the aspects covered in this standard will assist in some measure to maintain the quality and durability of variable capacitors by emphasizing a few of the many misuses which occur in the use of this component.

0.4 In the preparation of this standard assistance has been derived from IEC document 40 A (Sectt) 39 'Guide to the use of variable capacitors in electronic equipment' issued by the International Electrotechnical Commission.

0.5 This standard is one of a series of Indian Standards on capacitors and resistors used in telecommunication and electronic equipment.

0.6 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a tset, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in rounded off value should be the same as that of the specified value in this standard.

*Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard outlines the methods that should be followed by the equipment designer and those handling or using variable capacitors.

2. PACKAGING AND STORAGE

2.1 During the various stages of packing, unpacking, storing, transporting, and assembly, including unpacking and packing for storage or inspection, care shall be taken to ensure that:

a) the rotor vanes of capacitors are at the maximum capacitance position or completely enmeshed with the stator vanes. In this way, the danger of fingers or other extraneous objects touching and damaging the vanes is minimized;

b) trays of capacitors are not stacked on top of each other by being supported on other capacitors;

c) capacitors are stored in such a way that they are separated from each other and protected from dust and dirt;

d) storage conditions are within the limits implied in IS : 7748 (Part I)-1975* preferably in normal atmospheric conditions as specified in IS : 589-1961†;

e) in the event of capacitors being returned to the suppliers they should be properly packed to prevent damage; and

f) the capacitors should not be dropped during mounting in equipment assembly in storing.

3. MOUNTING AND ASSEMBLY

3.1 Care shall be taken to ensure that the capacitor is not mounted on an uneven surface, for this may cause distortion of the frame assembly and a subsequent capacitance change due to variation in the air gaps between rotor and stator vanes. It has been known for example, that the mounting surface is sometimes made uneven by the insertion of connecting wire or perhaps washers under one of the mounting feet. This practice should be avoided.

3.2 If the mounting is suspect, the maximum capacitance should be measured before and after mounting in the equipment or test fixture. If any change is detected after mounting, then the method of fixing is suspect and may need modification. By mutual agreement, a small change may be tolerated provided that the test fixtures used by the user and supplier are identical.

*Specification for variable capacitors: Part I Tests and general requirements.
†Basic climatic and mechanical durability tests for electronic components (*revised*).

3.3 When assembling control knobs or any other parts on to capacitor spindles, the forces applied should not exceed those which are applied during the approval testing of the component.

3.4 When assembling capacitors on a chassis or printed circuit board with power driven tools it is imperative not to use the capacitor as a bearing point during the process.

4. SOLDERING AND CONNECTING LEADS

4.1 When connections are made to variable capacitors, it is important that the solder tag or any other part of the capacitor is not overheated and that the physical strain imposed on the capacitor by the connecting leads or by injudicious use of pliers, etc, is minimized.

4.2 In any case, the strains imposed should not exceed those which are stipulated in the appropriate tests specified in IS : 7748 (Part I)-1975*.

5. ADJUSTMENT

5.1 Rotor contacts are carefully adjusted to the correct pressure by the manufacturer and subsequent adjustment should not be allowed, for it may introduce other complications, for example, crackles, noise, etc.

5.2 The practice of bending the adjuster vanes to change the capacitance value when the capacitor is assembled in the equipment should be forbidden.

6. LUBRICATION

6.1 Unless instructions are given to the contrary, it is inadvisable to provide any additional lubrication for the rotor bearings or for any other moving parts. Capacitors are lubricated during manufacture and the lubricants used are carefully chosen to satisfy certain conditions of humidity, temperature and conductivity throughout the life of the capacitor. Cleaning by use of the solvents should not be permitted.

7. MISCELLANEOUS CAUSES OF DAMAGE

7.1 Equipment designers are inclined to use the variable capacitor as an anchoring point for other items in the apparatus, a procedure which often entails, drilling and tapping holes in the frame of the capacitor. This practice is very strongly deprecated, for apart from the strains which are inevitably set up by drilling and tapping holes, there is a possibility that the frame will be weakened causing mechanical instability. When holes are provided in the frame of the capacitor, which are intended to be used for anchoring brackets, etc, it is important that the brackets or other items are made from a thin material which will not introduce strains in the capacitor frame.

*Specification for variable capacitors: Part I Tests and general requirements.

7.2 Metal stamps should not be used for cutting identifying numbers or letters on the metal parts of capacitors. This will cause permanent distortion of the frame and render the capacitor useless.

7.3 It is bad engineering practice to use any part of the rotor or stator vane systems as an end stop. If necessary, equipment designers should incorporate properly designed end stops in the drive mechanism.

7.4 Subsequent machining operations on the rotor spindle, such as the drilling of cross holes, re-shaping and sawing, will inevitably cause damage to the rotor bearings and should not be permitted under any circumstances.

7.5 Damage to rotor and stator vanes is often caused by fixing screws which protrude too far into the capacitor. It is essential for this to borne in mind when the length of capacitor fixing screws is being specified.

8. MEASUREMENTS

8.1 When capacitance measurements are made on variable capacitors, it is important that the accuracy of the dividing head used for determining the angle of rotation is not nullified by play in mechanical couplings, grub screws, etc.

8.2 The decision whether or not a capacitor lies within the limits of the specification shall be governed by the capacitance measuring accuracy as defined in IS : 7748 (Part I)-1975*.

*Specification for variable capacitors: Part I Tests and general requirements.

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance,	mole	mol

Supplementary Units

Quantity	Unit	Symbol
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	Unit	Symbol	Definition
Force	newton	N	1 N = 1 $kg.m/s^2$
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2

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